SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. By means of a truth table show that proposition $(p \wedge q) \wedge \sim (p \vee q)$ is a contradiction.

17. If R is an equivalence relation on a set A, then prove that R^{-1} is also an equivalence relation on A.

18. In a Boolean algebra: Prove
    (a) Additive identity is Unique.
    (b) Multiplicative identity is Unique.

19. Prove that is $y = \sin(m \sin^{-1} x)$,

    $(1-x^2)y_2 - xy_1 + m^2 y = 0$

20. Show that $6x^2 + 13x + 6y^2 + 8x + 7y + 2 = 0$ represents a pair of straight lines. Also find the angle between them.

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APRIL/MAY 2023

BAMA15B/FAMA15B/CAMA15B — MATHEMATICAL FOUNDATIONS – I

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Simplify the following statements
    (a) $\sim\sim p$
    (b) $\sim (p \vee \sim q)$

2. Define tautology.

3. Define Relations.

4. What do you mean by null set?

5. State commutative law.

6. A hall has 12 gates. In how many ways can a man enter the hall through one gate and come out through a different gate?

7. State Leibnitz theorem.

8. Find $\frac{dy}{dx}$, where $y = \sin(ax + b)$.

9. Write the condition for the given two straight line are parallel and perpendicular.

10. What do you mean by straight lines?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Construct the truth table for $(p \vee Q) \vee \neg p$.

Or

(b) Show that $Q \vee (p \wedge \neg Q) \vee (\neg p \wedge \neg Q)$ is a tautology.

12. (a) Show that for any two sets A and B $A - (A \cap B) = A - B$.

Or

(b) Define

(i) Partial ordered set

(ii) Totally ordered set

(iii) Equivalence class.

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13. (a) Let B be a finite Boolean algebra and $b \neq 0$ in B. Let $a_1, a_2, \ldots a_k$ be all the atoms of B such that $a_i \leq b$. Then $b = a_1 v a_2 v \ldots v a_k$.

Or

(b) From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many ways can they be chosen?

14. (a) Find $\underset{x \to 0}{Lt} \frac{e^x - 1}{x}$.

Or

(b) Find the nth differential co-efficient of $x^2 \log x$.

15. (a) Find the equation of the straight line parallel to the line $3x - 2y + 7 = 0$ and passing through the point $(1, 2)$.

Or

(b) Find the equation of the line which passes through the point of intersection of the lines $5x - 6y = 1$ and $3x + 2y + 5 = 0$ and is perpendicular to the line $3x - 5y + 11 = 0$.